DOCUMENT RESUME

ED 303 082 HE 022 102

AUTHOR Bess, James L.
TITLE Leadership, Conflict Management, and Researcher Motivation and Productivity in Scientific R & D Laboratories: The Case of Japan. ASHE 1988 Annual Meeting Paper.
PUB DATE Nov 88
NOTE 78p.; Paper presented at the Annual Meeting of the Association for the Study of Higher Education (St. Louis, MO, November 3-6, 1988).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Business; Comparative Analysis; *Conflict Resolution; Developed Nations; Government (Administrative Body); Government School Relationship; Higher Education; Industry; *Leadership; Leadership Styles; Motivation; *Productivity; *Research and Development; *Researchers; Research Universities; Risk
IDENTIFIERS *ASHE Annual Meeting; Great Britain; *Japan; United States

ABSTRACT

A study on leadership, conflict management, research and development (R&D) worker motivation, commitment, and risk-taking propensity in universities compared with corporations and government is presented. It arose from the recognition that R&D in any developed country is critical to the continued well-being of its economy and people, and that university R&D management must continually be assessed. The three countries used in this study are Japan, the United States, and England, with focus on Japan. The following topics were examined: psychological characteristics of effective academic and industrial research leaders; styles of conflict management predominating in effective and ineffective leaders; impact of leader characteristics defined by the three independent variables on subordinate motivation and creativity; laboratory orientation; the market force effect on variables of interest; and leadership at the end of the project. Unlike the United States and England, education and industry are not closely articulated in Japan, and advanced education and training is largely relegated to on-the-job programs. In the United States individuality is tolerated and encouraged but in education, R&D is disadvantaged by its separation from industry. Four appendices include: demographic differences between corporations, universities, and government laboratories; leader attitudes and values; differences between sections rated high or low quality, and theoretical and policy implications. Contains about 175 references. (SM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED303082

Leadership, Conflict Management, and Researcher Motivation and Productivity in Scientific R & D Laboratories: The Case of Japan

James L. Bess
New York University

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

ASHE

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Paper presented at the annual meeting of the Association for the Study of Higher Education, St. Louis, MO., November, 1988.

HE 022 102

BEST COPY AVAILABLE

ASHE
ASSOCIATION
FOR THE
STUDY OF
HIGHER EDUCATION

Texas A&M University
Department of Educational
Administration
College Station, TX 77843
(409) 845-0393

This paper was presented at the annual meeting of the Association for the Study of Higher Education held at the Adam's Mark Hotel in St. Louis, Missouri, November 3-6, 1988. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Introduction

The study described herein arose out of the recognition that research and development in any developed country are critical to the continued well-being of the country's economy and to the long-term welfare of its people (Johnson, 1983). Since R & D is a fundamental function of universities, the effectiveness of its management must continually be assessed. This paper examines leadership, conflict management, and R & D worker motivation, commitment, and risk-taking propensity in universities, compared with corporations and government. Further, as R & D management has been highly successful in other countries, the research reported here is cross-cultural in nature. The three countries in which the research for this study is being or will be conducted are Japan, the United States, and England. This paper deals with the findings from the first of these countries.

Background

Evidence supports the notion that research and development practices have been extremely successful in the three named countries, though for quite different reasons. Recently, however, national leaders and the scientific community in general have expressed worry that in each country there are problems with the management of R & D. In Japan, for example, it is said that since much of the industrial effectiveness comes from applying theory originated elsewhere, basic research is inadequately attended to. In England, on the other hand, despite the highest per capita ratio of Nobel prize winners in the world, applied and developmental research is less successful, with extraordinary

theoretical discoveries left to other countries to capitalize on. The United States suffers with problems at both ends of the spectrum -- theory too frequently being left fallow for long periods and new technologies taking too long to be developed into market-viable products.

It is highly likely that economic conditions, cultural differences and a variety of organizational characteristics account for the variations found in the effectiveness of R & D across the three countries noted above. While prior research has identified a number of these characteristics (primarily having to do with structural differences within firms and personnel policies within those structures), it was the burden of this research to identify influential variables on the "idiographic" side of organizational behavior -- primarily leadership and conflict management -- and their effects on research worker motivation, satisfaction, organizational commitment and other personalistic conditions. As David Drew (1985) has noted, "Scientific research has become a complex system incorporating psychodynamic, interpersonal, institutional, and economic factors. Consequently, the effective use of management techniques assumes great importance in determining scientific success." (p. 5). He also notes that our knowledge base about the management of science is insufficiently developed, seriously impeding the exploration of scientific frontiers.

The focus of the research, then, was the management of the scientific research and development laboratory in three distinctive settings -- corporations, universities, and governmental institutes. Data have been collected first from

Japan, which has made enormous gains in productivity since 1945 . There has been much written about styles of Japanese industrial management, and much research continues to be conducted on the subject. It is conceivable that these same modes and management styles whch inhere in the industrial sector may obtain as well in the R & D area, accounting perhaps for some of the Japanese success. There are, however, hypothetically, important differences across the settings in which R & D takes place. Goal foci, role definitions, organizational complexity, and other conditions suggest that university R & D may be quite different in many ways from that in government and corporate settings. It was this possibility that directed the initial data analysis phases of the reearch. This paper covers a small portion of the analysis of the data from Japan dealing with the relationship of the type of leadership exercised to various attitudes of workers in R & D laboratories. Other papers are concerned with conflict management modes and with their implications for worker motivation.

R & D in Higher Education

The institution of higher education plays significant roles in most developed countries. In addition to its enculturation and training functions (e.g., undergraduate and graduate education), it acts as a major producer of new knowledge to be used both in scince and industry and in the continuing advancement of the general culture. In some national systems (as in Japan), the knowledge production function appears to have been substantially decentralized to the industrial sector. Research and development

units in business and industry bear the major burden of invention and adaptation of new ideas and products, allegedly leaving relatively little to the educational sector. Central government support of industrial research at both the basic and applied level is maintained at high levels and is distributed in sophisticated ways designed to stimulate and support R & D in areas deemed central to the nation's long term interests.

Research in Japanese universities tends to be conducted primarily by individual faculty members organized in units (called "Koza") with no more than three full-time faculty and associated graduate and support staff. Little or no "big science" takes place within Japanese universities, and few significant breakthroughs are made at universities. The pattern is one in which university graduates with talent seldom stay on at universities to receive their doctorates. Rather, they move directly to R & D laboratories in the largest and most prestigious corporations they can find where they are trained by the corporate staff to conduct research in the prescribed modes preferred at the corporation. (Indeed, the common practice if for dissertations to be prepared at corporate R & D centers, subsequently to be submitted to universities where, without coursework or continuous faculty oversight, the doctorate is usually conferred.)

While this bifurcation may have been functional in earlier times, some questions are being raised about the effects on the productivity and effectiveness of both education and industry (Anderson, 1984). In the last five to ten years, there has been

some modification of the traditional Japanese pattern, as the government has recognized the limitations of the domination of big sicence by the industrial sector with its more parochial research agendas. As a result, there has been a movement to establish large research laboratories which are associated with the more prominent universities in Japan.

This is not to say that the Japanese model must be adopted in toto. Many critics have begun to doubt the continued viability of both structure and processes in the Japanese industrial sector as well (Kagano, Nonaka, Sakakibara, & Okumura, 1983-84; Ohmae, 1985). They question the ability of the system to be technologically creative as well as adaptive in the increasingly competitive world markets. Since Japan is so dependent on those markets, the issue is a serious one. More specifically, the question is raised as to whether the phenomenon of Japanese "groupism" (Befu, 1980; Ouchi, 1981) and its associated structural and processual support systems (e.g., bottom-up -- "rengi" -- decision making, free and extensive information flow laterally and vertically, non-specialized career paths, job rotation, group evaluation, job security for life -- cf. Marsland, 1980; Pucik & Hatvany, 1983), while promoting harmony and communal spirit, prevents the individual growth and development, creativity and motivation which may be needed for organizational effectiveness in the new international markets (Christopher, 1984; but see Sugimoto & Mouer, 1984; Shimada, 1985).

The pattern in the United States is obviously quite different. Universities account for the vast majority of federally dispensed research and development funding, though the

corporate sector also receives some. But although education is more intimately involved in R & D in the United States, it is not at all clear that its management in either corporate or university labs is exemplary. Critics are quick to question the continuing strength of U.S. competitiveness (Fusfeld, 1986; Turney, 1983). The much lamented excessively short-term orientations of managers, lack of concern for high quality, labor-management separation, and high turnover, among many other organizational problems, have been widely discussed. Certainly there is much reason to believe that the viability of the R & D enterprise in this country will require some rather dramatic new thinking about leadership and organizational conditions in the laboratories both in the educational and industrial domains.

It would seem apparent that there are some aspects of industrial management in each country which are of value and others which need remediation. This research was intended to discover leadership orientations and patterns of management that lead to greater motivation, independence, and innovative disposition among workers in key national organizations concerned with industrial and social advancement -- i.e., research and development institutes. While this objective in general is certainly not a new one (see, for example, Likert, 1961; Thamhain & Gemmill, 1977; Thamhain & Wilemon, 1977), the prospects for success here are enhanced by the choice of unique variables examined for the first time in cross-cultural perspective. The proposed study follows in the tradition of Haire, Ghiselli and Porter (1963) and Bass, Burger, Doctor and Barrett (1979), but

focuses on the relative effectiveness of critical managerial perspectives and behaviors and their effects on worker motivation.

Conceptual Framework

The concept of leadership has shifted since World War II. As has been well documented (cf. Bass, 1981; Vroom, 1984; Misumi & Peterson, 1985), researchers have moved from an examination of leader traits or dispositions to leader behaviors, to more contemporary theories of normative behavior contingent on situations and/or larger contexts. It has become clear of late that successful management involves a "fit" between the nature of the demands of the members of the organization and of its external environment and the psychological dispositions and behaviors of the leader. Some (e.g., Fiedler & Chemers, 1976) suggest that since personality or psychological traits are relatively intractable, the successful manager will be that person who is able to change the situation to meet his/her leadership predispositions. One problem with leadership studies is that the definition of the problematic situation is itself a social construction of the manager who thus may fail to see what the "true" (read, "rational, organizational") demands of the situation are.

This research addressed itself in part to this dilemma by examining the manager's psychological frames of reference (Shrivastava & Mitroff, 1983). By choosing the Meyers-Briggs Type Inventory (MBTI), a conceptual differentiation among types of

managers can be made which reflects alternative approaches to problem solving. The construction out of the Jungian typology of information acquisition and information processing by Kilmann & Herden (1976) and others provides useful diagnostic categories for understanding managerial dispositions. Managers whose preferred style is to take in data by sensing and to act on it by thinking (ST's) tend to be oriented toward goals of internal efficiency, while others (SF's) look to the more individual personal concerns of subordinates as measures of success. Still others (NT's and NF's) tend to look beyond the borders of the institution to seek respecti ither organizational achievements of a diverse anc somewhat impersonal kind or of a more global, humanistic nature.

The relationship of these alternative styles to organizational effectiveness in the three sample countries is of concern here. While there are numerous other possible psychological approaches to the study of leadership or/and decision making (cf. Miller, Kets de Vries & Toulouse, 1982; Driver, 1984), the Kilmann and Herden mode lends itself to answers to the questions of the advantages and limitations of Japanese, American and British management. For example, it may well be that given the domestic and world market conditions for each country from 1945 to, say, 1980, the special mix of Jungian types which emerged in each country may have "fit" the contingencies. Thus, Japan's particular concern with internal effectiveness and efficiency during this period may have demanded ST's and SF's which apparently were in abundant supply. On the other hand, those same managers in today's more competitive

international environment may be inappropriate (Cameron & Whetten, 1984; Bess, 1983). As Hoy and Hellriegel (1982) note, the MBTI "represents a safe, but powerful means for assisting a group of small business managers to gain self-insight into their natural inclinations and the manner in which this insight might influence the problems and goals they emphasize ..."

The second concept is conflict management style. The issue of the health or devisiveness of conflict has largely been settled in the literature. The consensus seems to be that "managed conflict" is necessary -- i.e., the encouragement in an organization of conflict which is organizationally, rather than personally, focussed and which is manifest, rather than latent (Pondy, 1967; Deutsch, 1973; Thomas, 1975; Thomas, 1979; Greenhalgh, 1986). The model chosen for this research is that of Thomas as operationalized in the Thomas-Kilmann Conflict Mode Instrument. Derived in part from the conceptualizations of Blake and Mouton (1964), the model allows the identification of five conflict management approaches which are generated out of an analysis of the dispositions of respondents to two basic orientations: the desire to maximize one's own satisfactions in a conflict dispute and the desire to cooperate with others in a dispute. These are conceived as independent dimensions such that different persons may score high or low on each. Each of the modes of conflict resolution is appropriate for different contextual conditions (Thomas, 1977) as follows: competing (when quick, decisive action is important); collaborating (when the interests of the parties in dispute are seen as too important to

be compromised); compromising (when goals are deemed important, but preservation of interpersonal harmony is believed to be critical); avoiding (when the conflict is over apparently trivial matters); and accommodating (when one party's stake in the conflict outcome appears minor and the desire to cooperate with others predominates). For the samples in this proposed research one would expect to find significant differences along a number of the dimensions of concern. For example, as the notes which accompany the Thomas-Kilmann instrument indicate:

> As behaviors, collaborating and compromising are quite different. Collaborating means working with the other to seek solutions which completely satisfy both parties. This involves accepting both parties' concerns as valid and digging into an issue in an attempt to find innovative possibilities. It also means being open and exploratory. In contrast, compromising means seeking an expedient settlement which only partially satisfies both people. It doesn't dig into the underlying problem, but rather seeks a more superficial arrangement -- e.g., split ting the difference. It is based upon partial concessions -- something to get something -- and may be played close to the vest.

It is highly likely that Japanese American, and British conflict management styles will be different, marking different emphases on what Thomas calls the "integrative" (increasing the size of the pie) vs "distributive" (cutting up the pie) dimensions of conflict resolution. Hypothetically, so also will there be differences between academic and non-academic settings. Further, what will be of interest is the interaction of psychological type with conflict management style (cf. Kilmann & Thomas, 1975) as well as the effect of both on the ranking of the unit and the motivation of the workers. The Thomas-Kilmann instrument has been extensively tested and found to be valid and reliable

(see, for example, Kilmann & Thomas, 1977). The instrument is comprised of only 30 items and has been successfully translated into French, Spanish, and, in the first phase of this research, Japanese. This research will provide the first opportunity to examine these conflict management modes under varying conditions in cross-cultural comarison with the Japanese (whose conflict management modes are alleged to be distinctive).

The last concern is with the dependent measure in this study -- the motivation of workers. The subject of employee motivation has received considerable attention among industrial and organizationai researchers (see, for example, the reviews in Lawler, 1973; Steers and Porter, 1975; Staw, 1983; and Pinder, 1984). Less work has been done on faculty and/or professional researcher motivation (but see Hagstrom, 1965; Gaston, 1978; Andrews, 1979; Bess, 1977, 1982; Lewis & Becker, 1979; Fulton & Trow, 1981; Staw, 1984). Theories of work motivation are frequently classified into "content" theories (usually, need/drive approaches -- e.g., McClelland, Maslow, Alderfer, Herzberg) and "process" theories (commonly oriented toward explaining the elements which initiate and sustain or change behavior -- e.g., Porter and Lawler, Vroom, Adams). In this study, the intimate and subtle linkages between intrinsic and extrinsic sources of motivation are viewed as critical. This dictated the choice of the "job characteristics" model (Hackman & Oldham, 1980), which is built in part on Maslow's (1943) need hierarchy and in part on expectancy theories.

The Hackman and Oldham model recognizes the influence of the management decisions about the design of work conditions (job

design), especially decisions having to do with styles of organizational control and task or worker interdependence. Among the values of the instrument for this study is that one measure of concern -- the "motivating potential score" is "a means for summarizing the overall degree to which a job is objectively designed in a way that maximizes the possibility for internal motivation on the part of the people who perform it." (Hackman & Oldham, 1974, p. 25). It also permits an independent measure of subordinate "growth need strength". Both are important in understanding the nature of the differences between cultures and settings, as well as the influence of psychological type and conflict management style of the leadership. A potential side benefit of this study is the possibility of using the data from the JDS to correlate both job characteristics and psychological states with leader types and conflict modes.

The dependent variables described above are "internal" to the organization. As such, they may or may not be related to laboratory or institutional effectiveness measured in the system surrounding the organization (regardless of the definition of "effectiveness"). While there is some support in the literature that there is some correlation between high motivation, commitment and satisfaction in workers and institutional effectiveness as a whole, an additional measure of external success of the laboratory has been added to the design for this research. Although the specific criteria differ in the three countries, there are effectiveness rankings of firms and universities (though not of independent laboratories). (See, for

example, Arimoto, 1978; Jones, Lindzey, and Coggeshall, 1983; Toyo Keizai, 1987; Japan Times, 1987; Fortune 500, 1988). Post-hoc assignment of industry or university rank to the randomly sampled institutions will permit an analysis of the relationship of the key variables to external measures of effectiveness.

Clearly omitted in this research are several key organizational variables which surely have some influence on effectiveness and subordinate motivation. As Pelz and Andrews (1976, cf. Pelz, 1978; Andrews, 1979; Lambright & Teich, 1981) so well revealed, scientists in organizations need an optimum mix of control and freedom for maximum satisfaction as well as productivity. Though measures of bureaucratic control structures and processes (Ouchi, 1978) in the units under investigation are not explicitly addressed in the proposed study, they will be indirectly recorded through the Hackman and Oldham measures.

Also of consequence, but not considered here is the subject of "organizational," as contrasted with "national" culture (Selznick, 1957; Schein, 1985; Deal and Kennedy, 1982). While variance in the dependent variable between units as a result of climate and value differences must surely exist, in this research other sources of explanation are sought. More particularly, the key assumption here is that national cultures and values will have a profound effect on the nature of managers, the nature of conflict management and the resultant strength of motivation of subordinates (Haire, Ghiselli & Porter, 1963; Hofstede, 1976, 1980; Kraut, 1975; Barrett & Bass, 1976). While the measure of "success" or "effectiveness" in this study is internal to the national culture (i.e., the quality rankings within each country

and may even vary in definition across institutions within them)), the question is begged of the long-range "fit" of organizational internal success to national survival and continued health. If, however, it can be shown that employees in organizations at the tops of their fields are found to have high motivation and productivity, it is reasonable to assume that national welfare will be enhanced if similar policies are adopted in organizations lower in the effectiveness ratings.

Criticisms of the job characteristics approach and of the Hackman and Oldham instruments (Roberts and Glick, 1981; Aldag, Barr & Brief, 1983; Dunham, Aldag & Brief, 1976), as well as the potential bias from subjective reports of job characteristics (Van de Ven & Ferry, 1980, pp. 59-62) have been partially addressed (Oldham & Hackman, 1981). Moreover, the concern in this proposed study is primarily with the dependent measures in the model -- i.e., internal work motivation and various kinds of satisfactions (growth, social supervisory, security, pay, and general), which would seem to have been sufficiently validated in the development of the instruments.

It should also be pointed out that the study is primarily concerned with horizontal, not vertical conflict. Further, it is not addressed to the leadership dynamics of the resolution of that conflict. That is, the objective is to identify modes of leadership and conflict management in general, without describing (for this particular research) the concrete behavioral components of the processes.

Finally, it should be noted that this study is descriptive

at the organizational level, not normative at the cultural level. That is, it is not the intent to make judgments about the values of the national culture or of the organizational dynamics which may follow from it. Sullivan's (1983) discussion of industrial clans and humanism, for example, is only tangentially related to the central concerns of this study.

Methods

Standardized instruments with published valid and reliable translations were selected as the major medium of data collection in the Japanese survey. Choosing well tested questionnaire instruments which had been professionally translated mitigated many potential problems of researcher cultural naivete or bias which might have occurred though other more qualitative research methods. While there is still some controversy over instrument translations (Deutscher, 1968), properly chosen instruments can produce the data needed for cross cultural comparisons (see Triandis, 1972, especially pages 35-57; also Brislin, Lonner & Thorndike, 1973). To the standardized instruments were added a number of variables especially relevant to cross-cultural study, as well as a range of demographic and controlling variables. All are being subjected to the usual statistical scrutiny for reliability and validity. The instrumentation for the U.S. and British phases will generally follow the same format as that used in the Japanese study, though pretesting may dictate some changes.

The design of the research utilized three conceptualizations of organizational phenomena which had never been combined: the studies of leadership utilizing the Jungian psychology that Kilmann

and Herden (1976) had originated; the identification of alternative modes of conflict resolution that Kilmann and Thomas (19XX) developed; and the "job characteristics" theory originated by Hackman and Oldham (19XX).

The three independent variables were operationalized as follows: (1) LEADERSHIP STYLE (measured by the Meyers-Briggs Type Indicator (MBTI) -- Meyers, 1962; McCaulley, 1981; Kilmann & Herden, 1976); (2)CONFLICT MANAGEMENT STYLE is measured by the Kilmann-Thomas "MODE" instrument; and (3) MANAGERIAL ATTITUDES critical in personnel areas, measured through some original scales developed for this research. The dependent variable of primary interest is MOTIVATION, which is tested through the administration of the Hackman and Oldham Job Diagnostic Survey (which provides, in addition, measures of perceived "job characteristics" conducive or deleterious to motivation). Other dependent variables include satisfaction, commitment and risk taking propensity. All of the English language questionnaires were translated into Japanese, then backtranslated to assure at least minimal validity, subject to empirical testing and other validation techniques.

The unit of analysis for the study was the R & D laboratory "section", defined as a subunit of 15-40 workers. This choice was dictated by the need to circumscribe the research to cover "face-to-face" leadership, rather than the more distant leadership that might be tapped by examining laboratory leadership at the top. Scientific research and development laboratories in selected industrial, governmental, and university organizations in the three countries were chosen. The specifics of the sample are

given later. Below, the variables are outlined in some greater detail, with some examples of the research questions associated with each:

Independent Variables

LEADERSHIP STYLE
Across the three countries, what kinds of leadership types exist in different laboratory organizations (university, corporation, government institutes) and in different fields (e.g., electronics, iron and steel, chemicals, and transportation -- see below for detail)?

CONFLICT MANAGEMENT MODES
What are the various modes through which interpersonal conflict (in many forms) is productively resolved -- and how do these differ over types of laboratory organizations and fields?

MANAGERIAL ATTITUDES

Control of Work
In different kinds of laboratories what is the manager's attitude toward worker versus management control over choice of projects and project methods?

Focus of Rewards
To what extent does the laboratory leader emphasize individual or group achievement?

Norms of Information Flow
Are workers encouraged by management to share discoveries freely or to keep them secret?

Social Status
Does management practice a hierarchy of status relationships, or is the pattern more egalitarian?

Nature of Sanctions
Are positive or negative sanctions typically applied by managers?

Risk Taking
Are workers encouraged to take risks in their research or to work on projects with more certain outcomes?

Dependent Variables

MOTIVATION, SATISFACTION, COMMITMENT, RISK-TAKING
What levels and types of worker motivation and

satisfaction exist, how much commitment to the organization and its goals is there, and to what extent are workers willing to take risks in their research endeavors?

Controlling or Ancillary Variables

RESEARCH ORIENTATION

When an R & D organization emphasizes basic, applied or developmental research, what kinds of leaders and conflict management are the most effective?

FIELD AND ECONOMIC CONDITIONS OF THE MARKET

To what extent and in what way do industries in declining, steady state, or expanding markets differ in R & D leadership? What differences exist among organizations in the fields of electronics, iron and steel, chemicals, and transportation, the fields chosen for analysis in the Japanese phase?

LABORATORY AGE/RESEARCH PROJECT STAGE

What is the relationship between R & D management style and the age of the laboratory and stage of development of a project.?

DEMOGRAPHIC CHARACTERISTICS OF LEADERS

How are age, education, and employment history related to R & D management style?

The basic questions above are amplified in the sections which follow:

A. What are the psychological characteristics of effective academic and industrial research leaders? While simple analysis of leadership traits has been generally discredited, the use of the MBTI may yield new findings which reflect contingencies where certain traits may be more successful. For example, concerns for internal efficiency or effectiveness may, under certain conditions, have to be subordinated to market share or social responsibility pressures.

B. What styles of conflict management predominate in effective and ineffective leaders? The use of the Thomas-Kilmann MODE instrument will reveal distinctive approaches to conflict resolution (e.g., accommodative, competitive, compromising, avoiding, or collaborating) which, in turn, reveal culture-bound and/or specialized academic/industrial dispositions. Which approaches lead to organizational effectiveness in Japan, the United States, and England and in the non-profit versus profit sectors of interest here?

C. What is the impact of leader characteristics defined by the three independent variables on subordinate motivation and creativity? Are there specific combinations of psychological characteristics of leaders, group conflict management styles, and managerial attitudes which produce departments which are reputed to be more successful than others and which also promote subordinate satisfactions? Under what conditions is individual motivation enhanced or inhibited (e.g., when "efficiency" is the leadership orientation and "collaborating" the conflict management mode -- or is some other combination appropriate)?

D. Are there differences in the fit between the above independent and dependent variables across the sectors of interest -- corporations, government institutes, and universities? Does successful conflict management in universities, for example, require different modes than in corporations or government institutes?

E. Is a laboratory orientation toward basic, applied or developmental research related to the nature of the leadership and conflict management found in there?

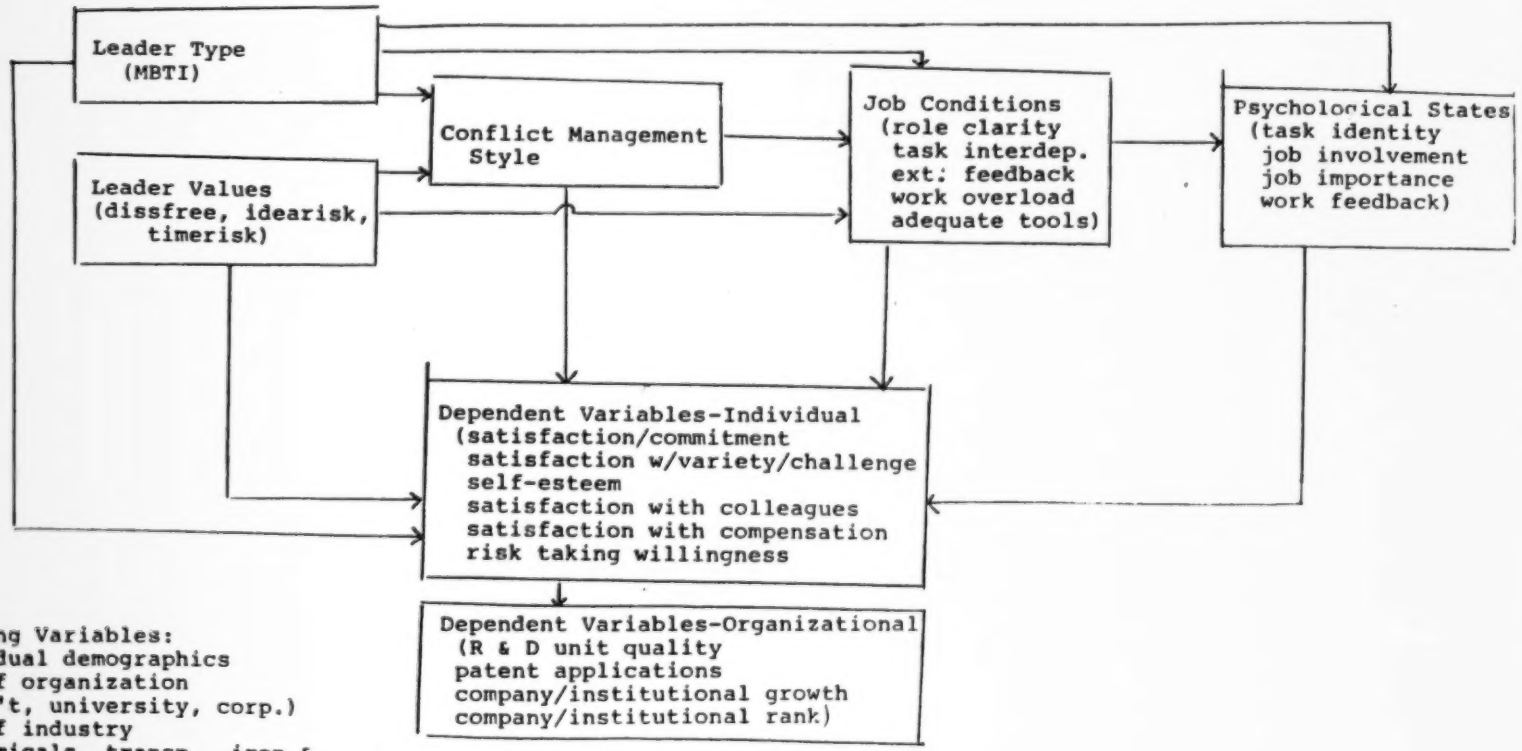
F. How do market forces (e.g., perceived availability of funding for research in key areas) affect the variables of interest? In a declining field, for example, are certain kinds of leadership and conflict management more effective?

G. As projects near completion, is a different kind of leadership required than for projects just beginning or at the mid-point?

A schematic diagram outlining the mulitivariate relationships among these variables is presented on the following page.

Collection of data in a foreign country constitutes an especially difficult task in the face of the language barrier as well as the cultural biases with respect to such issues as honesty in responses. For example, whereas in the United States, it is possible to select a random sample from a population and to survey that sample by securing names and addresses from some reliable source, such may not be the case abroad. In the first place, directories of institutions are organized in different ways from the Western tradition. Even with the help of skilled translators, it is only by trial and error that the non-native

CONCEPTUAL FRAMEWORK FOR THE RESEARCH



Moderating Variables:
- Individual demographics
- Type of organization
  (gov't, university, corp.)
- Type of industry
  (chemicals, transp., iron & steel, electronics)
- R & D orientation
  (basic, applied, developmental)
- Country
  (Japan, U.S., Britain)

researcher can discover the criteria for inclusion or exclusion from a directory.

The objectives of the research dictated the selection of a survey research population constrained by several variables. First, the economic sector of the laboratory (government, university or corporate) had to be differentiated on the grounds that the subcultural differences among these types might require different kinds of leadership. Second, the type of industry (iron and steel, chemicals, transportation, and electrical) was chosen for the current varying economic circumstances in which the industries exist. It was reasoned, for example, that industries in decline, steady state or ascent might benefit from different kinds of R & D leaders (as, for example, if the research in the industry requires incremental versus breakthrough advances).

A third cut in the sampling was actually conducted post hoc. Research and development in the basic, applied and developmental areas could require quite different leadership styles to be successful. A set of questions in the survey instrument were designed to capture this dimension.

Still another criterion used in the sampling was suggested by the desire to obtain a model or prototypical group, identified through independent means, against which the other surveyed laboratories or groups of laboratories could be measured. In the Japanese phase, such a category was found in the special funding provided by Japan's federal agency concerned with national scientific industrial productivity (MITI). Nine nationally known scientific researchers had been given large grants to establish

and lead R & D laboratories without the usual sponsor control over objectives and methods. A sampling of sections within these laboratories was conducted to provide the model data.

Finally, because of the uncertainties of the method of survey research in Japan, in-person contacts were made with six selected large organizations, and arrangements were made to garner the direct support of the directors of some of their R & D laboratories. The six were:

Corporate:
- Mitsubishi Metals
- Mitsubishi Electric
- Nissan Motors
- Nippon Steel

Government
- Agency for Industrial Science and Technology

Quasi-government
- National Telephone and Telegraph (newly converted from a public to a private organization)

Directories of R & D laboratories were used to select names of laboratories in each of the three sectors. The inital sample was comprised of 180 laboratories in each (not including the above grouping). A size criterion cutoff was chosen to standardize the population. Each laboratory, furthermore, was required to have at least one section of 15 to 40 workers -- the unit of analysis for the study.

Names of the section leaders were not available in the directories, partly because in Japan there is a strong pattern of frequent job rotation and partly, as in America, because directories tend not to be updated regularly, leaving obsolete names. More important, section heads tended to be relatively low

in the hierarchy and were seldom listed.

Because of this condition, it was decided to send the survey to the laboratory director himself with instructions to redistribute the questionnaires. This decision was made also because it was felt that the powerful forces of hierarchical authority would improve the response rate at the section level when a request was received from the director of the laboratory. In point of fact, this was a double-edged sword (no Japanese pun intended), since another tradition in Japanese organizations is for the leadership never to "make a decision" that has not been cleared below. Hence, there were many delays as well as declinations from this procedure.

The directors of the laboratories were asked (in Japanese translation) to select two sections to which sets of questionnaires were to be delivered. The instructions also asked them to make the selection on the following grounds: one section should, in the opinion of the director, be headed by an exemplary person whose effectiveness had been demonstrated in previous R & D success; the other section leader was to be a "less than maximally effective" one. (How this subtle, and not offensive, communication was actually translated and received is still uncertain. In point of fact, subsequent comparisons between "quality" levels on most of the variables of the study have not [yet] proved to be productive.)

Both of the two section leaders who received the packages of questionnaires were asked to fill out questionnaires designed for section leaders and to distribute to six of their workers another type of questionnaire designed for the latter. Special

instructions were included to prevent the section leader from distributing the questionnaires to workers thought to have unusually favorable or deviant attitudes toward the leader or the laboratory. All of the questionnaires were accompanied by stamped, self-addressed envelopes that ensured their delivery to a prominent well-respected Japanese "think tank" in the Tokyo area (which also, incidentally, offered its imprimatur for the study in the cover letters).

Including both random and non-random samples, a total of 160 questionnaires was received from section leaders, and 796 questionnaires were received from R & D workers. No follow-up letters could be written to elicit a greater response, as in Japan such an overture would be construed as an insult. That is, it must be assumed that the request was received and attended to. Calling attention to a "failure" to respond, or even hinting that the questionnaires may have been overlooked would be to cause a loss of "face" and would not only have been ineffective but would have embarrassed the agency sponsoring the research.

At this writing, it is unclear exactly what the response rate was and what, if any, was the nature of the response bias. For example, in a number of cases, no questionnaires at all were received from the laboratory, implying that there was a decision at the laboratory level not to cooperate in the study. An analysis of the respondents and nonrespondents at the organizational level will be conducted. In some cases, questionnaires were received from section leaders, but not from workers, indicating (perhaps) that the section leader did not

distribute the questionnaires below his level. In other cases, some, but not all, workers returned questionnaires, and in a number of instances, even when workers returned questionnaires, there was none from the leader. All of these sources of potential bias have yet to be sorted out. It should be noted, however, that Japan is a highly homogeneous society. Hence, most (but clearly not all) non-respondents probably do not differ as significantly from respondents as might be expected in the United States.

Data Analysis

Data from each questionnaire were punched into a computer and verified in Japan and transferred to tape for transport to the United States. Here they were prepared for analysis at NYU's computer facility. After the usual data cleaning, factor analyses were performed to determine whether the pre-existing theoretical concepts and instrumentation from the Western literature held up with Japanese data. In particular, the MBTI, the Thomas-Kilmann MODE, and the Hackman-Oldham JDS questions were subjected independently to principal components factor analyses with varimax rotations. The results of this analysis revealed, not surprisingly, that the reliability and validity of the United States instruments were only partially confirmed.

The characteristics of the scales created by the items in the factor analysis of the MBTI are listed in Exhibit II below.

Exhibit II
Scale Names and Reliabilities for the Japanese MBTI

Name	No. Items	Reliability (alpha level)
Extroversion/Introversion I	5	.70
Feeling/Thinking	4	.69
Intuition/Sensation	3	?
Thinking/Feeling	3	.66
Sensation/Intuition	4	.70
Extroverion/Introversion II	2	.53
Extroversion/Introversion III	2	.58
Judging/Perception	2	.49

(Note: While these reliabilities are marginally acceptable, the varibles do provide sufficient diagnostic power to suggest that further refinement by Japanese psychometrists may be worthwhile. Further descriptions of the composition of these scales is available on request.)

The English version of the MBTI suggests that Thinking-Feeling is one dimension and Sensation-Intuition another, resulting in the four personality types. For this sample, however, two separate factors for each dimension emerged from the factor analysis. In each case, the similar factors were virtually uncorrelated, but inverse in the factor weights. For example, the three items in the first Sensation/Intuition factor loaded heavily on the sensation side (i.e, were positively weigthed), while the second Intuition/Sensation factor was loaded on the intutioni side -- the inference being that two subsamples were involved. In the analysis, only the first T/F dimension (Eigen value = 4.1) and the first N/S dimension (Eigen value = 2.7) were used, as these tended to be most closely correlated with the dependent variables. Additional research will be necessary to determine the reasons for the multidimensionality of the two dimensions in the Japanese setting, but from the first two dimensions alone, as will be seen, are sufficiently diagnostic for a first look.

To establish the four leader types, each dimension was divided into high and low categories, with a fifth ctegory established as a "mixed" leadership style. The score cut-offs used to create the categories were as follows:

Exhibit I
Cut-offs of Scale Scores for MBTI Categories

Feeling/Thinking Range	Intuition/Sensation Range: 3	4	5,6
8	NF		SF
7		Mixed	
4,5,6	NT		ST

Clearly, the division of the scale scores into these categories is arbitrary. All that can be said is that the subjects who fall into one or another section are higher or lower or different from the others. Unfortunately, it is not possibible at this point to draw comparisons with conditions in the United States. For example, the lowest Japanese score on F/T may be higher than the highest U.S. score. Further investigation is planned of the psychometrics of the U.S. MBTI and a testing of the Japanese version in a United States setting will be conducted in order eventually to make the cross-cultural comparisons.

The categories of the Thomas-Kilmann MODE instrument also broke down somewhat in the Japanese testing (though as with the MBTI, the dimensions are interestingly diagnostic and refelctive of cultural differences). As this paper does not utilize data from this instrument, discussion of the scale properties is deferred to a later time.

The categories of the Hackman-Oldham JDS held up with the Japanese data only partially. The following variables and their reliabilities are noted below:

(insert Exhibit II about here)

To compare the MBTI scales with those above, the latter were divided into three categories: scores greater than one standard deviation above the mean constituted the "positive" attitudes of the workers. Scores more than one standard deviation below the mean were considered to be "negative" effects of the leadership style, while scores between plus and minus one standard deviation were considered to represent neither positive or negative effect.

These latter were discarded in the analysis. This division resulted for this array of data in adequate cell sizes only for the negative side (the data being slightly skewed in this direction). Hence, findings of the relationship between

Dependent Variables
(Modification of Hackman-Oldham Instrument)

Scale Name	No. Items	Reliability
Satisfaction with and Commitment to Org'n	14	.93
Work task interdependence	8	.73
Satisfaction with work variety and challenge	7	.83
Task identity/meaningfulness	5	.76
External feedback adequacy	3	.79
Satisfaction with colleague support	6	.77
Work overload	?	???
Adequacy of tools and equipment	2	.85
Self-esteem	2	.87
Job significance	3	.79
Job content feedback adequacy	3	.64
Role clarity	2	.63
Job involvement	2	.63
Satisfaction with compensation	2	.68

the leadership styles (MBTI) and the worker attitudes (the modified JDS) are reported here only for the negative effects by leader category, controlled for type of laboratory (government, university, or corporation).

Findings

The number of findings from this research are many and diverse. In this paper only those dealing with differences among universities, government institutes and corporations are reported. Four sections follow: (1) laboratory/section attitudes on a variety of demographic dimensions; (2) attitudes of leaders; (3) motivation, satisfaction, and risk-taking differences among workers; and (4) the impact of leaders by psychological type on motivation, satisfaction, and risk-taking.

Differences Between Corporations, Universities, and Government Laboratories

To give some continuity to the disucssion, a summary of the findings in this area is presented first. It is followed by some details of the data.

(Not included in this paper. See Appendix A.)

Attitudes and Values of Leaders

There were also differences in leader attitudes and values. These included such matters as source and degree of control over work, nature of authority relationships, freedom to communicate outside of the organization, etc.

(Not included in this paper. See Appendix B.)

Differences in Modified JDS Across Types of Laboratories

In this section the mean scores on the fourteen scales developed from the factor analysis of the Japanese data on the JDS are compared across corporations, universities and government.

(Not included in this paper)

Differences in Relationships of Leader Types to Worker Attitudes Across Types of Laboratories

In this fourth and final data analysis section, the relationships between leader types and some of the fourteen variables comprising the modified JDS, controlling for type of laboratory (university, government or corporation) are presented. The analysis proceeds in the reverse direction from that suggested by the theoretical foundations of the JDS, looking first at the dependent variables, then to the job conditions and psychological states, and finally to motivational factors. More particularly, the flow is as follows:

A. Work task interdependence
   Work overload
   Role clarity
   Adequacy of tools

B. Job content feedback
   External feedback

C. Satisfaction with compensation
   Satisfaction with colleagues

D. Task identity
   Job significance
   Job involvement
   Self-esteem

E. Satisfaction & Commitment
   Satisfaction with Variety

While in some cases the cell sizes for the university laboratories were less than the minimum required for the chi square statistic, the test is robust enough to permit conclusions to be drawn about the differences. However, for this paper, only differences across the types of labs showing the negative effects of different types of leaders could be analyzed because of the relatively low numbers. That is, differences across the three sectors (government, university and corporation) are reported only for dependent scale scores falling at or below one standard deviation below the mean. A summary chart revealing the findings

for all fourteen variables is shown and discussed first. This is followed by a consideration of some of the variables separately.

(Insert Exhibit I about here)

A brief explanatory note of caution is in order here. By observing the differences among laboratories in worker reported attitudes, the inference should not be drawn that a particular type is necessarily "bad." Rather, the conclusion should be drawn that leaders with these predispositions are not able to give adequate time and attention to leadership responsibilities that the demands of group, organization, and circumstance demand. Inherent in this analysis, then, is the "fit" or "contingency" notion now prevalent in leadership theory (however those contingencies may be extraordinarily different in another culture).

The Exhibit displays the overall relationships between psychological type of leader and the fourteen worker variables. There is a consistency across variables within the economic sectors -- government, university and corporation -- and a great disparity across them. For example, in government R & D laboratory sections, it appears that without exception when SF types are leaders, there is a strong negative effect. Not only are the independent variables in the Hackman-Oldham framework more depressed in the presence of SF's, but so are the dependent variables (e.g., satisfaction and commitment to the organization and satisfaction with variety and challenge). A clearcut case also exists for the least deleterious effects (i.e., the pattern of leader types that is most closely associated with fewer reports by workers of negative effects). Intuition types as

Exhibit I
Leader Types with Highest and Lowest Negative Effects on Dependent Variables by Economic Sector

Variable	Government		University		Corporation	
	Highest	Lowest	Highest	Lowest	Highest	Lowest
1. Work Task Inter-dependence	SF	NT	M,SF	ST	ST,NT	M,NF
2. Work Overload	SF	NF,NT	M	ST	ST,NT	M,NF
3. Role Clarity	SF	NT,NF	SF	ST	NT,ST	M,NF
4. Feedback from work itself	SF	NT	M	ST	SF,ST	M,NF
5. Feedback from others	SF	NT	M	ST	SF	NF
6. Adequacy of tools, equipment	SF	NT	M	ST	ST	M,NF
7. Satisfaction with compensation	SF	NT,NF	NF	ST	ST,NT	M
8. Job significance	SF	NF,NT	M,SF	NT	NT	M,SF
9. Job involvement	SF	NT,NF	M	ST	ST	M,NF
10. Self-esteem	SF	NT,NF	M	ST	ST,NT	M,NF
11. Task identity	SF	NT,NF	M	ST	ST,NT	M,NF
12 Satisfaction with colleague support	SF	NF	M	ST	ST	M
13. Satisfaction with and commitment to organization	SF	NF	M	ST	NT,ST	M,NF
14. Satisfaction with variety and challenge	SF	NF,NT	M,SF	ST	NT,ST	M,NF

leaders, especially NT's, are more frequently associated with fewer workers expressing negative attitudes (i.e., more than 1 S.D. below the mean).

A completely different picture appears for universities and corporations. In the former, mixed type leaders are least desirable, while ST's appear more favorable, producing the fewest number of workers with negative attitudes. In corporations, almost a totally opposite findings occurs, with ST's being least desirable and M's and NF's the most.

It is perhaps easiest to analyze these patterns if the assumptions of the Hackman-Oldham model are accepted here. That is, it would follow that when job conditions do not produce desired psychological states, end result variables will also be negative. It is useful, consequently, to start the separate analysis of the fourteen variables with the dependent side of the Hackman-Oldham model, then trace backward the sources of influence on those variables..

In Exhibit II below, the data showing the relationships between the five MBTI types and the first dependent variable, "satisfaction with and commitment to the organization", are given.

(Insert Exhibit II about here)

As will be seen, this Exhibit and others that follow reflect the overall patterns presented in Exhibit I. Of immediate noteworthiness in this Exhibit is the overall difference in the distributions of the five types. In the government sector, the SF type leader appears to have the most deleterious effects on

Exhibit II

Leader Type and Worker Attitude by Type of Laboratory

1. Satisfaction with and Commitment to the Organization
(Negative Effects -- % by column)

	Government	University	Corporation	Total
NF	11	24	13	14
SF	35	24	17	26
NT	11	18	30	20
ST	19	6	28	20
Mixed	25	29	12	20
N	81	34	76	191

Chi square - 25.29
D.F. = 8
Significance = .0014

satisfaction and commitment to the organization (35%), while for the university, it is the leader with no predominant type -- the mixed leader (29%). In corporations, negative effects are most highly correlated with NT or ST typee leaders (30%; 31%).

It is not surprising that in the government sector, which is primarily concerned with the enhancement of the general welfare, a leader whose personality disposition (NF) "matches" that need produces the least undesirable effect on workers (fewer workers reporting dissatisfaction). NF's are concerned with social welfare in a broad general sense, certainly the prime manifest objective of government R & D laboratories. Looked at from the other side, the sensation oriented/feeling leader (SF) in government labs seem to have the most unfortunate effect.

There are several reasons why this apparent compatibility may produce the desired results. First, perhaps the long-term, outside orientation of leaders with NF dispositions is theoretically of potential benefit to a non-profit organization seeking to identify and solve scientific problems for the good of the society. The Japanese government is a forceful and effective presence in Japanese society. It is responsive to the corporate sector which dominates the R & D field, while at the same time taking the initiative for filling perceived gaps. Workers will, therefore, in all likelihood tend to see their leaders as compatible with the goals and objectives of the larger organization to which they belong.

The NF leader is also suitable for the day-to-day requirements of R & D administration in the laboratory. Japanese workers identify with fierce loyalty with their organizations,

and their organizations respond with a filial type concern and caring, which is intense and continuous. For the most part this organizational response is peer dominated. That is, the Japanese worker submerges himself primarily in his immediate group and finds succor from their support. There is, to be sure, a certain kind of leader-worker interaction in every group. However, the "leader" in this case is more frequently a person of higher position and status, usually the department chairman or laboratory director, depending on the size of the units and organization. Indeed, the Japanese organization qua "family" reinforces family-type roles such as father, mother, and sibling, though these family roles must be understood as they are conceived and enacted in a distinctive Japanese culture.

The Sensation/Feeling leader, on the other hand, deals in the minutia of interpersonal relations. This special orientation may be ill-suited to the needs of government R & D workers whose autonomy is critical to effective functioning. Here again, it should be noted that autonomy in Japan is group centered, not individual centered. That is, the group needs, and is given, great discretionary power, thus obviating the need for close supervision by a formal leader. Too, as discussed below, group, rather than individual, tendering of "consideration" (in the leadership jargon) is the norm in Japan, except for special circumstances where personal problems are attended to by persons outside of the immediate formal work group, but within the organization.

An apparent reversal of logic takes place in the corporate sector where the "thinking" types (NT and ST), hypothetically highly beneficial to corporate efficiency, are least effective. To speculate, perhaps in corporate laboratories, with their heavy emphasis on practical matters and their short-term perspective, workers' feelings are less attended to. Note that the feeling dimension is missing from the NT's and ST's. In corporation labs, compared with government and universities, the number of projects underway at any one time is fewer, the time on projects is shorter, there are more and different people from other organizational functions, the leaders are younger, and turnover of leadership is higher. These conditions may engender an anxiety about changing group relations that may be exacerbated by the production and efficiency orientations of leaders. Note that M's and NF's have the least unfortunate effects on workers in government labs, indicating perhaps that a balanced leader orientation is especially important.

Further, as with the government sector, the external orientation of the leader may also be potentially beneficial. Corporate success in Japan is measured not in profitability but in financial stability or security, realized in part through steady growth and large size. Hence, even at the section level, the leader who can forward the goals of section, lab, and company will be more likely to engender feelings of satisfaction and commitment.

The first of the independent variables to be discussed is work or task interdependence. Again, there are significant differences across the laboratories as revealed in Exhibit III.

Exhibit III

Leader Type and Worker Attitude by Type of Laboratory

2. Work task interdependence

(Negative effects -- % by column)

	Government	University	Corporation	Total
NF	13	23	10	13
SF	35	26	17	26
NT	10	16	31	20
ST	22	7	32	23
Mixed	20	29	11	18
N	79	31	82	192

Chi square = 27.71
D.F. = 8
Significance = .0005

Different kinds of leaders are associated with different patterns of worker interdependence. For example, in the government sample, the least interdependence (most autonomy*) was associated with a SF type leader (35%). For universities, it was the mixed leader (29%), while in corporations, the ST or NT (32%, 31%) type leaders had this effect. More interdependence in universities, on the other hand, was associated with ST's (7%) while in government labs, it was NT'S (10%) and in corporations, with NF's or Mixed leaders (10%, 11%). Recasting these rank orderings into chart form reveals some rather dramatic differences as noted in the table below (which is a subset of the Exhibit above).

*Note: the way that the data are calculated makes the reporting grammatically difficult. A high percentage means that there were more workers scoring in the lower range for the variable (greater than -1 S.D.) with leaders of this type.

	Government	University	Corporation
More interdependence (less autonomy)	NT (10%)	ST (7%)	NF,M (10%;11%)
Less interdependence (more autonomy)	SF (35%)	M,SF (29%;26%)	ST,NT (32%;31%)

It is extremely difficult to interpret the corporate data. It would be reasonable to assume that pragmatic conerns for efficiency and effectiveness would lead to the employment of Thinking types in order to structure the interactions more collaboratively, especially to foster the technology transfer process. In Japan, there is a much greater integration of functional areas (marketing, engineering, production, and R & D) than in the United States, thus necessitating more interdependence among workers. Yet, Thinking types in this research are found to be associated with most worker autonomy. The finding reported earlier that Thinking types also are associated with less satisfaction with and commitment to the organization makes this finding of greater autonomy even more anomalous. It may be that it is the <u>failure</u> of the ST and NT leader to create tight bonds of interdependence in the face of corporate needs for that interdependence that creates the dissatisfaction. That is, if R & D workers in corporate labs require close collaboration with others, and, if as reported here, that collaboration -- or at least interdependence -- is not forthcoming, there may be some degree of dissatisfaction.

Alternatively, it could be that the frequent job rotation system in Japan and the highly collaborative interactions across functional boundaries makes ST and NT leaders appear superfluous,

especially to workers alredy committed to the goals of corporate growth and efficiency. (As will be seen later, satisfaction with work variety and challenge is also lowest for NT's and ST's).

This conclusion is confounded somewhat in the light of the data for university laboratories where ST'S produce most interdependence/least autonomy (in direct contrast to corporations). Since ST'S also are related to highest satisfaction and commitment to organization (or, more correctly, with least detriment to satisfaction and commitment), it is possible to interpret the internal efficiency orientation of the ST leader in university labs as providing more structure in the somewhat more anarchic setting, thus giving workers a greater sense of coherence and focus within the laboratory. The ST leader can reduce the Japanese worker's sense of isolation occasioned through his greater autonomy by giving him a more ordered environment in which to work. These speculations would seem to confirm thelong-held position of leadership theorists that organizational contingencies dictate a "fit" between workers and leaders. In the corporate setting, ST's are related to highest worker interdependence, but only moderate overall satisfaction and commitment, while in the university these same types are related to more autonomy and higher satisfaction and commitment.

Worker satisfaction with work variety was examined next. The data are given in Exhibit V below.

(Insert Exhibit IV about here)

Exhibit IV
Leader Type and Worker Attitude by Type of Laboratory
3. Satisfaction with Work Variety and Challenge
(Percent of column totals)

	Government	University	Corporation	Total
NF	10	23	13	13
SF	38	27	18	28
NT	11	17	30	20
ST	22	7	28	22
Mixed	19	27	12	17
N	79	30	87	196

Chi square = 23.73
D.F. = 8
Significance = .0025

Again with this variable, it is useful to identify types of leaders who have most and least pernicious influence. NF type leaders seem to be least effective in government and university labs (38% and 27%), as seen by the number of workers dissatisfied with their work variety and challenge. In the corporate sector, it is NT's (30%), followed by ST's (28%). Least detrimental are the sensation types in Government NF- 10%; NT - 11%), ST's (7%) in universities, and mixed or NF's (12%; 13%) in corporations.

It is understandable that in the government sector, section leaders with concerns for public welfare are most effective, as noted earlier. Socialization processes in Japan are extreme and effective. Japanese work enterprises are "total organizations" in Goffman's terms. Hence, workers in the organizations can be expected almost completely to have adopted the requisite values

and to have made them their own. The leader of the organization, in this case the scientific laboratory section, is the personification of those values and the one with whom workers identify (and the one whom they helped to have chosen as their leader). This similarity of values of worker and leader may in fact contribute to the sense of satisfaction of the workers.

Once again, as noted above, the posture of the NF leader is toward the outside -- toward the fulfullment of organizational objectives vis-a-vis the general public (or, perhaps less romantically, of his section within the organization that constitutes its environment. That is, the section sees its role as providing for the good and welfare of the system external to it, in this case the organization as a whole. Further, NF type leaders are likely to be engaged in external relations more than internal, thus (by benign neglect, perhaps) allowing more worker autonomy and hence satisfaction with variety and challenge.

A similar argument might be made for the corporate sector where NT's and ST's are least likely to produce workers who are satisfied with work variety and challenge. It is conceivable that in the more turbulent external and internal corporate world, with its rapid personnel rotation policies, NT's who look primarily <u>outside</u> the boundaries of the organization tend to neglect the individual needs of workers for work variety and challenge. In this case, because of the different context, the neglect is not benign. ST's, on the other hand, may be overly concerned with efficiency which requires more specialization. The latter, in turn, is inversely correlated with the generalization and

challenge forthcoming from working on many different jobs.

Alternatively, it could be that under the press of short-term corporate goals, accentuated by the leader, work variety and challenge for workers exceeds the optimum amount.

The more favorable impact of NT's in the university sector speaks to the felicitous effects of the apparent "mismatch" of leader type to organizational type -- i.e., the alleged need of the organization for a leader whose dispositions suit the current internal and external conditions. NT's tend to be concerned with external conditions, growth, market share, resource acquisition. Japanese university laboratories with NT leaders have successful entrepreneurs -- leaders who are able to attract new resources and make a name for the university. For workers accustomed to the snail's pace of university growth, these leaders may be able to provide just the variety and challenge they have been looking for.

Summary

In some contrast to the United States and England, education and industry are not closely articulated in Japan. Advanced education and training is largely relegated to carefully orchestrated on-the-job programs (Cantor, 1985). College graduates are typically placed in firms in accordance with the prestige of their degree-granting institutions and the hierarchy of status of the corporation. Both practices are alleged to produce a homogeneity of values and ideological perspectives which makes "groupthink" (Janis, 1972; Janis & Mann, 1977) a real danger in the production of both basic and applied research in the corporate sector (though see Sullivan, Suzuki & Kondo, 1985). As a Japanese proverb puts it, "deru kugi wa sugu utareru" -- "the nail that protrudes gets pounded down."

On the other hand, in more egalitarian societies such as the United States, individuality, if not idiosyncratic behavior, is tolerated or even encouraged, often to the disadvantage of collaborative groop behavior which may be needed, particularly for some kinds of research.

In the field of education, research and development is also disadvantaged by its separation from industry. The lack of reliance by the industrial sector on trained personnel from departments of graduate education and new knowledge from academic research and development units in the universities results in underutilization and often poor management in higher education. Without market demands for quality or quality of education or research output, academic research and development tends to lie fallow.

In each country, despite the constraints on individual or group activity, there are examples of highly successful units in government, corporate and academic sectors. What special characteristics of the leadership orientations and behaviors and conflict management modes in these "anomalous" units contributes to that success constitutes the thrust of this research.

Karl Weick (1984) has seriously questioned the need for "cohesion" in research settings, suggesting that effective organizations trade off cohesion for "accuracy" -- an enhanced sensitivity to the needs of their clients. What kinds of leaders manifest the proper balance between cohesion and accuracy in their conflict management modes is the question of concern here. The findings from the research should be of value in the explication of the conflicting demands of individual and social system. In particular, the research should contribute to the research community investigating the concepts of leadership, conflict management, and motivation in organized settings. The research links conceptual frameworks not previously aggregated and should provide important new insights into the theoretical relationships among them.

The particular findings reported in this paper demonstrate the importance of the contextual factors accompanying each of the sectors investigated -- corporate, university and government. In each case, a disctinctively different type of leader was associated with different levels of motivation of workers. Clearly there is more work to be done before a conclusion can be drawn that motivational deficiencies of R & D workers also are

related to lower levels of output of the laboratories. Previous research on the relationships between satisfaction and productivity has shown that connection to be tenuous at best. Nevertheless, there is in the research reported here some reason to believe that leadership does, in fact, make a difference at some human level in the organization and that there is still room for more investigation of the effects on external effectiveness.

Appendix A
Demographic Differences Between Corporations, Universities and Government Laboratories

To give some continuity to the discussion, a summary of the findings in this area is presented first. It is followed by some details of the data.

Since research and development in Japan is carried out in different organizational settings, some effort in this study was made to determine the important structural and processual differences across these work places. Some significant differences among these types of laboratories exist. Because of the nature of the organizational control structure, university laboratories tend to be smaller, with fewer research projects under way, and with more of an emphasis on basic (rather than applied or developmental research) than in corporations or government labs.

University section leaders tend to have held their positions for much longer than leaders in other type organizations, probably owing to the relative infrequency of changes in jobs compared to corporate and government laboratories.

Corporate laboratories have younger section leaders. Because corporate R & D is expanding, there are opportunities for upward mobility in the laboratories. In addition, there is some recognition of the need for young leadership, especially in scientific domains.

Corporate leaders tend to keep their communications within the corporate sector -- in contrast to leaders of other labs who

communicate somewhat more with outside people. The understandable need in the corporate sector to maintain secrecy about discoveries may inhibit frequent outside contact on business-related matters. On the other hand, in universities, the tradition of cosmopolitanism, as well as the relatively small academic community lends itself to a more open and fluid cross-institutional communication pattern.

Corporations tend to concentrate on developmental research and are more willing to terminate research projects sooner than others. Here again, this finding reflects the more pragmatic corporate concern for short-term results. Government laboratories, on the other hand, concentrate most on applied research and tend to be willing to continue a research project for a longer period of time (as much as 26% longer than universities and 34% longer than corporations).

Data Detail

	C*	U*	G*
A. Section Leader Characteristics			
1. Corporation section leaders are at least five years younger than leaders of university and government sections.	Age		
	47	53	54
2. University section leaders have been in office more than twice as long as others.	Years in Office		
	2.6	7.1	2.8
3. Government section leaders spend more time with others outside of their own and similar institutions.	%Time in Other Settings		
	14	19	26
4. Universities have the fewest number of professional research workers per section.	No. Professional Workers		
	31	11	28

*C=Corporation U=University G=Government

5. Universities have the smallest administrative staff size per section.

No. of Administrators		
8	2	8

6. Universities begin fewer research projects each year.

No. Projects Begun in Year		
17	7	18

7. Corporations are willing to terminate research projects sooner than others (months).

Minimum Project Length		
14	19	21

8. Government laboratory sections are willing to continue a research project longer. (months)

Maximum Project Length		
50	53	67

9. The emphases of the three types of laboratories differs.

	% Section Emphasis		
Basic	10	54	21
Applied	40	33	52
Developmental	50	13	27

10. Prospects five years from now for increases in funding for research are viewed more optimistically by corporate leaders. (1=Rapid Growth; 5=Rapid Decline)

Mean Growth Estimate		
2.5	3.2	3.0

Appendix B
Leader Attitudes and Values

There were also differences in leader attitudes and values. Concerning the source and degree of control over the work setting, there are a few differences between the three groups but no clear positive or negative feeling on most issues among the managers in each category. On average, though most leaders in all three groups moderately agree that workers should have a considerable voice in the choice of project on which they are working, no clear consensus exists within each group with respect to manager versus worker control over the pace of the work, the standards of quality allowed, or responsibility for evaluation of the results of research.

The issue of nurturing of individuality in the service of creative research and development was important in this research. Section leaders in each group seem moderately to favor group rather than individual effort and satisfactions (corporations, somewhat less so.)

Part of this research was concerned with the nature of the flow of information within the laboratory as well as across laboratory boundaries to the professional and business communities outside. In general, section leaders expressed fairly high agreement that workers should have freedom to communicate about their work with others outside the unit (somewhat less in the corporate sector).

Another issue of concern was whether a more hierarchical versus egalitarian ethos existed across the types of laboratories. Section leaders on average expressed no positive

feelings about the use of formal job titles, job seniority, or age as bases for allocating special privileges.

Worker motivation was viewed by section leaders on the whole as best stimulated by positive incentives rather than negative sanctions, though leaders agreed rather strongly that workers should be made aware of penalties for failure.

Risk taking is critical to new discoveries, and most laboratory leaders in this study believed that it should be encouraged (less so in universities). On the other hand, no clear opinion emerged with respect to whether workers should attempt to depart from known methods and procedures or ideas and theories.

Data Detail

(Scale: 1=Very Strongly Disagree; 7= Very Strongly Agree)

	C Mean	U Agreement	G
11. Leaders in all three groups agree only moderately agree that "workers should have a considerable voice in the choice of project on which they work."	5.5	5.6	5.7
12. For all three groups there is no clear opinion that workers should or should not be permitted to set the pace of their work.	4.7	5.0	4.7
13. There is also considerable difference of opinion in the three groups as to whether "workers should not be allowed to set the standards of quality for the work they are doing."	3.6	3.7	3.9
14. There is also no clear approval or disapproval within each of the groups as to whether "workers should have the responsibility for evaluating the results of their research."	5.7	5.8	5.5
15. Leaders in each of the three groups express some moderate agreement with the notion that group rather than individual satisfactions should be sought by workers.	4.1	4.9	4.9

16. Along these same lines, leaders in all three groups moderately disagree with the statement that "workers should concentrate on individual projects rather than contribute to group efforts."

3.3 3.8 3.2

17. Though leaders in all three groups believe in open communications, there are some differences among them with the statement that "people should have little freedom to discuss their research findings with workers from other institutions."

2.4 1.6 1.9

C U G

18. So also is there moderate agreement on freedom of publication, though leaders of corporate sections are somewhat more restrictive.

4.0 5.9 5.1

19. Section leaders in the three groups disagree as to whether "management should <u>not</u> be involved in the determination of when and where new discoveries may be released to the outside public."

1.9 4.4 2.4

20. There is no clear consensus in any of the groups concerning the question of whether "formal job titles should <u>not</u> be used as a basis for allocating privileges and perquisites to the group."

4.2 5.3 4.8

21. Nor does consensus emerge when leaders are asked whether "job seniority or age should <u>not</u> be used as a bsis for distributing special privileges."

4.2 4.6 3.8

22. Section leaders in university laboratories tend to place less "emphasis ...on job titles in the manner of interaction and verbal address among workers."

5.0 4.2 5.0

23. Leaders in all three groups very much believe in providing "positive incentives (instead of threats of punishment) for work achievement."

6.6 6.3 6.7

24. And "workers should not be made to fear negative consequences for their mistakes."

4.9 5.3 5.8

25. On the other hand, there was also considerable agreement with the statement that "supervisors should make workers aware of penalties for failure on a particular job."

5.2 5.6 5.0

26. Risk taking at work "should be strongly encouraged" was

endorsed by most leaders in the three groups, though somewhat less so in the university setting.

6.4 5.3 6.3

27. And "workers should make investments of substantial time in work with unknown likelihood of success."

5.7 5.8 5.5

28. Further, "workers should be rewarded for creative experiments which are not ultimately successful."

5.2 5.7 5.5

29. However, the statement "workers should <u>not</u> attempt to depart from methods and procedures known to be appropriate" was met with mixed reactions.

3.7 3.8 3.9

30. Nor should workers "attempt to depart from ideas and/or theories known to be valid."

3.7 3.4 3.8

Appendix C
Differences Between Sections Rated High or Low Quality

Part of this study was concerned with differences in management attitudes and techniques as practiced by leaders of laboratory sections rated by the overall director of the laboratory as "highest quality" contrasted with something less than highest quality. Differences within each of the three types of laboratories -- corporate, university, and government -- emerged. Though relatively few differences between types of laboratory were revealed, there were several interesting findings within each category.

> JB-- note the following ignores the magnitudes of the responses. Make sure you do not report that hi q leaders tend more than low quality to do xxxx without saying that both agree very little with the statement.

Summary

Corporate Laboratories:

High quality laboratories sections tend to have younger section leaders, and these leaders have worked at fewer other institutions than the one at which they are presently employed. Sections in high quality corporate labs are smaller. Partly as a result, there are fewer research projects begun each year. Projects deemed to be unsuccessful in high quality laboratories are teminated sooner, while promising projects are extended longer in high quality laboratories. The higher the quality of the corporate laboratory, the less likely it is to engage in basic research. Surprisingly, high quality laboratories apply for fewer patents each year than do lower quality corporate laboratories.

Leaders in high quality corporate laboratories tend somewhat more to agree that workers should not be able to choose the materials and procedures used in the project on which they are working. High quality laboratory leaders tend more to value group rather than individual recognition for high achievement.

High quality section leaders report more agreement on the one hand that people should have little freedom to discuss research findings with workers from other institutions (probably in recognition of the need to preserve corporate secrets). On the other hand, high quality leaders tend more to believe that workers should be free to publish the results of their research.

There is a clear trend in high quality corporate

laboratory sections for leaders to have more egalitarian values than do their counterparts in lower quality sections. High quality leaders tend more to believe that privileges should not be allocated to certain workers, that formal job titles should not be used as a basis for allocting privileges and perquisites, that job seniority or age should not be a basis for distributing special privileges and that leaders should not always be first authors of published articles.

While they are more willing to overlook poor performance on a particular job, high quality, more than low quality section heads, believe workers should not attempt to depart from ideas and/or theories known to be valid. Perhaps this conforms with the above notion that group rather than individual frames of reference are more salient in high quality government laboratories.

University Laboratories:

There are no significant differences between leaders in high and low quality laboratories sections.

Government Laboratories:

Sections in high quality government funded laboratories tend to let projects' continue for longer periods than do low quality sections. In high quality sections, the emphasis is more on basic research, about the same on applied research, but less on developmental research. High quality government laboratory sections tend to apply for more patents.

Section leaders in high quality laboratories are more pessimistic about future funding than are those in low quality sections.

High quality government laboratory section leaders tend to agree more strongly than low quality leaders that workers should not be allowed to set the standards of quality for the work they are doing. Just as in the corporate section, high quality government laboratory section leaders believe more strongly than in low quality sections that individual workers should not expect to be publicly recognized for creative achievements. Thus a somewhat stronger group-centered ideology seems to be associated with higher quality. High quality -- or at least reputation for it -- is more likely then even when individual creative achievements do not receive attention.

Low quality government laboratory leaders believe

more than high quality leaders that management should be involved in the determination of when and where new discoveries may be released to the outside public. Hence, control over information seems to be associated with lower quality laboratory performance.

Interestingly, while government laboratory sections are not different on the whole from corporate laboratories in their emphasis on hierarchical rather than egalitarian norms, there are differences in attitudes of leaders across quality levels. While in the corporate sector, high quality seems to be associated with more egalitarian attitudes, in the government laboratories, leaders tend to be more hierarchical or bureaucratic. High quality government laboratory leaders tend to disagree more strongly that workers should be allowed to determine unit policy and that little emphasis thould be placed on job titles in interpersonal relations. On the other hand, just as in corporate laboratories, the higher quality section leaders tend to believe that the section chief or unit leader need not always be listed as first author of a published article.

High quality government laboratory section leaders more strongly agree than low quality leaders that most of their workers are motivated more by fear of failure than by promise ofsuccess and its rewards. On the other hand, what may account for the success in high quality laboratories is the leader agreement that workers should not be made to fear negative consequences for their mistakes.

Like corporate leaders, high quality government laboratory leaders tend to agree more than low quality leaders that workers should not attempt to depart from ideas and/or theories known to be valid.

Appendix D
Theoretical and Policy Implications

The significance of the results of this research lies at both the practical and theoretical level. Policy decisions in national scientific councils, corporate strategic planning, and personnel decisions in the laboratory will all be informed by the findings. This is especially true as the strengths of each country become known and the possibilities of cross-cultural organizational learning become manifest (see, for example, Buckley & Mirza, 1985) . At the theoretical level as well, it is expected that old theory, particularly in the area of leadership and conflict management, will be subjected to some necessary revision. A brief discussion of each follows.

In the domain of policy, perhaps first and most obvious, if different leaders are found to be significantly different in their effectiveness, then it is important to be able to select those who are more effective. The research is expected to identify the characteristics of leaders found to be successful managers of research and development. This information can be used by those who choose leaders -- both in institutions which elect and those which select leaders. For example, the research will show what kinds of leaders are needed in each of the three settings (corporation, government institute, and university), in the many different fields, and in laboratories with predominently basic, applied or developmental goals. It will reveal the combinations of leadership style and conflict management modes in various organizational settings and external conditions which will result in more commited, satisfied, motivated, risk taking and productive workers.

A second key implication lies in the area of the formation of national research funding policy. Regardless of the variations in national systems of support for basic and applied research, it is necessary to allocate funds so that they can be most efficiently utilized. This research will inform the makers of national policy as to the levels of research worker motivation, commitment, risk taking, and satisfaction as these workers are engaged in different types of research under varying leadership conditions. It may be, for example, that allocating funds to the academic, instead of the industrial, sector may be more cost efficient in certain fields (though this may vary by country).

A third use of the findings will be by leaders now in office as they seek to become effective. While some social science research suggests that leadership style is relatively inflexible because of personality invariance, other research says that leaders can and should adapt their behavior to the needs of the situation. In knowing what kinds of leadership style and conflict management works best, current leaders may be able to adjust their behavior accordingly. A laboratory director who recognizes the requirements of his laboratory can thus direct his energies in ways which will maximize worker motivation.

A fourth by-product of this research lies in the possibility of better task design. Some newly published research indicates that the proper design of work is important in sustaining subordinate motivation and commitment to organizational goals. The findings from this study should enable leaders better to match the design of work settings both to the needs of the workers and the requirements for effectiveness. Variables also under study in this research describe a host of conditions in the R & D lab which may be needed to improve the efficiency and effectiveness of the laboratory operation.

Another practical implication lies in the advancement of educational policy. It is conceivable that from the findings of this research, new modes of conducting research under different organizational constraints and different leadership/conflict management styles will be identified. These may very well suggest entirely different modes for the education and training of research scientists and engineers. Issues of specialization and of collaboration/cooperation which are important in the laboratory are relevant to the education and socialization of graduate students.

A final practical implication of the research has to do with the formation of national labor and educational policy. The prosperity of any country is at least partially dependent on the wisdom and skill with which national leaders are able to identify and control the flow of talented young people into positions of responsibility (as, for example, into leadership positions in research and development). The findings from this research should provide useful data for the purpose of determining the allocations of funds for education and training, as well as, perhaps, to facilitate the cross-institutional employment mobility of skilled workers.

On the theoretical side, there are also expected results of significance. Unresolved questions in several domains of social scientific research will be addressed by this research. Literature on the foundations of effective leadership under various organizational constraints will be enhanced through the findings. Many issues in organizational design, job design, and motivation will be informed through the results of the proposed study. And the possibilities and limitations of cross-cultural comparisons in the area of research and development, as well as the more basic conceptual frameworks applied to it, will benefit from this study. Finally, little or no prior consideration of or empirical research on the multivariate effects of leadership and conflict management <u>in combination</u> on subordinate motivation, satisfaction and commitment has thus far been undertaken. The findings from the proposed research should add measureably to our understanding of this complex phenomenon.

Two more specific examples of the possible theoretical implications of this research can be cited. The first deals in part with the issue of the invariance of personality across situations (Mischel, 1968, 1983; Bem & Allen, 1974; Kendrick &

Stringfield, 1980). It also deals more specifically with the controversies in the study of leadership over whether leaders can change their styles in varying circumstances (e.g., Fiedler vs Ohio State et al.) If the Jungian types of personality do not vary under different conditions of organizational stress, then it is likely that modes of managing that stress (or conflict in this case) are not likely to vary. Hence, this research should produce a finding demonstrating strong relationships between each of the four personality types and the five conflict management modes (in the Kilmann-Thomas inventory). Further, if, as Kilmann & Herden note, there is a fit between type and organizational need, we might expect, for example, that Sensation/Thinking types would be comfortable in a Competitive setting where control is important to produce internal efficiency. On the other hand, if the social constraints of the organizational environment are severe, it is possible that ST's will modify their "personalities" to accommodate their peers. Hypothetically, this will produce <u>less</u> efficient behavior, (given the ST orientation in the Kilmann-Herden model). But will this take place equally in all three countries? That is, if the leader determines that subordinate motivation is important to compliance, then a more participative model of decision making is called for (cf. Vroom & Yetton, 1973). The theoretical issue of interest here is whether in more productive organizations (and ones with more motivated employees) the impetus to participation is universally manifested in behavioral change. If not, how can the anomalies be explained?

Still another exmample of possible theoretical implications is the concern of the study with the relative importance of intrinsic versus extrinsic sources of reward (Deci, 1975; Ross, 1975; Zuckerman et al., 1978; Staw, 1976). The issue lies in the conceptualization of the notion of both "intrinsic" and "extrinsic." For example, in Japan, intrinsic, egocentric sources of motivation are habitually subordinated to extrinsic ones. Hence, it is critical to discover in successful research settings how leadership deals with the organizational need to evince individual behaviors which may have positive efficiency and effectiveness consequences for the organization, but negative social consequences for the individual. If, for example, the demands of the environment call for a leader disposition which maximizes the organization's bargaining position in environmental exchange (an "NT"), a mode of conflict management may be required which may not attend to the organization's needs for pattern maintenance and tension reduction, to use the Talcott Parsons's terminology (Parsons, 1951). The crumbling of the organization's unified, singular identity which employees in some countries use as an alter ego, may have consequences for the organization quite different from those desired by the leader. Conversely, efforts by an SF leader to create tightly defined normative structure in the interests of promoting a positive group climate may overconstrain the individuality so critical to original research (cf. Ouchi, 1980).

References

Aldag, Ramon J., Steve H. Barr & Arthur P. Brief, "Measurement of Perceived Job Characteristics," Psychological Bulletin, November, 1981, 90, 3, 415-431.

American Association for the Advancement of Science, AAAS Report XII, Research & Development FY 1988. Washington, D.C.: American Association for the Advancement of Science, 1987.

American Assembly, Technological Innovation in the '80s. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1987.

Anderson, Alun M., Science and Technology in Japan. Harlow, Essex, England: Longman Goup Ltd, 1984.

Andrews, Frank M. (ed.), Scientific Productivity, The Effectiveness of Research Groups in Six Countries,, Cambridge, England: Cambridge University Press, 1979.

Andrews, Frank M., "Motivating Diversity and the Performance of Research Units," in F.M. Andrews (ed.), Scientific Productivity, The Effectiveness of Research Groups in Six Countries. Cambridge, England: Cambridge University Press, 1979.

Badaway, M.K., Developing Managerial Skills: Succeeding as a Technical Manager. New York: Van Nostrand, 1982.

Bailyn, Lotte, "Autonomy in the Industrial R & D Lab," Human Resource Management, Summer, 1985, 24, 2, 129-146.

Bhagat, R.S., "The Role of Subjective Culture in Organizations: A Review and Directions for Future Research," JAP Monograph, 1982, 67, 653-685.

Barrett, Gerald V. & Bernard M. Bass, "Cross Cultural Issues in Industrial and Organizational Psychology," in Marvin E. Dunnette (ed.), Handbook of Industrial and Organizational Psychology. Chicago: RandNally College Publishing Company, 1976.

Bass, Bernard M., Philip C. Burger, Robert Doktor, & Gerald V. Barrett, Assessment of Managers, An International Comparison. New York: The Free Press, 1979.

Battelle Institute, Science, Technology and Innovation. Washington, D.C.: National Science Foundation, 1973.

Befu, H., "A Critique of the Group Model of Japanese Society," Social Analysis, December, 1980, 5/6, 29-43.

Bem, Daryl J. & Andrea Allen, "On Predicting Some of the People Some of the Time: The Search for Cross-Situational Consistencies in Behavior," Psychological Review, 1974, 81, 6, 506-520.

Bess, James L., "The Motivation to Teach," Journal of Higher

Education, May/June, 1977, 48, 1, 243-258.

Bess, James L., "Faculty Perspectives on Administrator Effectiveness (II): The Influence of Personality Type," Paper presented at the annual meeting of the American Educational Research Association, Montreal, 1983.

Bess, James L., Collegiality and Bureaucracy in the Modern University. New York: Teachers College Press, 1987.

Beyer, Janice M., "Ideologies, Values and Decision Making," in Paul C. Nystrom and William H. Starbuck (eds.), Hanbook of Organizatonal Design, Volume 2. Oxford, England: Oxford University Press, 1981.

Blake, Robert R., & Jane S. Mouton, The Managerial Grid. Houston: Gulf Publishing Company, 1964.

Bowker, R.R., Industrial Research Laboratories of the United States, Including Consulting Research Laboratories. Washington, D.C.: National Research Councilk of the National Academy of Sciences, 1986.

Bozeman, Barry, Michael Crow, & Albert Link, Strategic Management of Industrial R & D. Lexington, MA: Lexington Books, 1984.
Brislin, Richard W., Walter J. Lonner, & Robert M. Thorndike, Cross-Cultural Research Methods. New York: John Wiley & Sons, 1973.

Buckley, P.J. & H. Mirza, "The Wit and Wisdom of Japanese Management: An Iconoclastic Analysis," Management International Review, 1985, 25, 3, 16-32.

Cameron, Kim S. & David A. Whetten, "Models of the Organizational Life Cycle: Applications to Higher Educaton," in J. L. Bess (ed.) College and University Organization: Insights from the Behavioral Sciences. New York: New York University Press, 1984.

Cantor, Leonard, "Vocational Education and Training: The Japanese Approach," Comparative Education, 1985, 21, 1, 67-76.

Child, John, "Culture, Contingency and Capitalism in the Cross-National Study of Organizations," Research in Organizational Behavior, 1981, 3, 303-356.

Christopher, Robert C., The Japanese Mind: The Goliath Explained. New York: Simon & Schuster, 1983.

Coan, Richard W., "Review of the Myers-Briggs Type Indicator," in Oscar F. Buros (ed.), The Eighth Mental Measurement Yearbook, Vol 1. Highland Park, NJ: The Gryphon Press, 1978, 973-975.

Cohen, David, Marilye Cohen, & Herbert Cross, "A Construct

Validity Study of the Meyers-Briggs Type Indicator," Educational and Psychological Measurement, Autumn, 1981, 42, 3, 883-891.

Comrey, Andrew L., "An Evaluation of the Meyers-Briggs Type Indicator," Academic Psychology Bulletin, March, 1983, 5, 1, 115-129.

Cresswell, John W., "Faculty Research Performance: Lessons from the Sciences and Social Sciences", Report #4. ED267 677. Current Index to Journals in Education.

Cummings, William K., Ikuo Amano, & Kazuyuki Kitamura (eds.), Changes in the Japanese University, A Comparative Perspective. New York: Praeger Publishers, 1979.

Deal, Terrence E. & Allan A. Kennedy, Corporate Cultures: The Rites and Rituals of Corporate Life. Reading, MA: Addison-Wesley, 1982.

Deci, Edward L., "The Effects of Externally Mediated Rewards ad Controls on Intrinsic Motivation," Journal of Personality and Social Psychology, 1971, 18, 105-115.

Deci, Edward L. & Richard M. Ryan, "Intrinsic Motivation to Teach: Possibilities and Obstacles in Our Colleges and Universities," in J. L. Bess (ed.), New Directions for Teaching and Learning: Motivating Professors to Teach Effectively, No. 10, June, 1982.

Dermer, Jerry (ed.), Competitiveness through Technology. Lexington, MA: D.C. Heath, 1986.

Deutsch, Morton, The Resolution of Conflict. New Haven: Yale University Press, 1973.

Deutscher, Irwin, "Asking Questions Cross-Culturally: Some Problems of Linguistic Comparability," in Howard S. Becker, Blanch Geer, David Riesman & Robert Weiss (eds.), Institutions and the Person. Chicago: Aldine Publishing Company, 1968.

Dill, David D., "Theory Versus Practice in the Staffing of R & D Laboratories," R & D Management, July, 1985, 15, 3, 227-241.

Dore, Ronald, British Factory Japanese Factory, The Origins of Diversity in Industrial Relations. London: George Allen & Unwin Ltd., 1973.

Drew, David E., Strengthening Academic Science. New York: Praeger, 1985.

Driver, Michael, "Decision Style and Organizational Behavior: Implications for Academia," in J. L. Bess (ed.), College and University Organization: Insights from the Behavioral Sciences. New York: New York University Press, 1984.

Dunham, Randall B., Ramon J. Aldag, & Arthur P. Brief, "Dimensionality of Task Deisn as Mesured by the Job Diagnostic Survey," Proceedings, Annual meeting of the Academy of Management, Kansas City, 1976, 89-93.

England, George W. & Raymond Lee, "The Relationship Between Managerial Values and Managerial Success in the United States, Japan, India, and Australia," Journal of Applied Psychology., August, 1974, 59, 4, 411-419.

Epton, S. R., R.L. Payne, & A. W. Pearson (eds.), Managing Interdisciplinary Research. Chichester, England: John Wiley & Sons, 1983.

Eto, Hajime & Konomu Matsui (eds), R & D Management Systems in European Research Centres, A Directory of Organizations in Science, Technology, Agriculture and Medicine. Harlow, Essex, England: Burnt Mill, 1986.

Farmer, Richard N., "Understanding the Ways of Understanding: Cross-Cultural Management Methodology Reviewed," in Richard N. Farmer (ed.), Advances in International Comparative Management, Vol. 1, 1984.

Fiedler, Fred W., Martin M. Chemers, & Linda Mahar, Improving Leadership Effectiveness. New York: John Wiley & Sons, 1976.

Frame, J. Davidson, Managing Projects in Organizations. San Francisco: Jossey-Bass Publishers, Inc., 1987.

Fusfeld, Herbert I., The Technical Enterprise. Cambridge: Ballinger Publishing Company, 1986.

Fusfeld, Herbert I. & Carmela S. Haklisch, "Cooperative R & D for Competitors," Harvard Business Review, November-December, 1985, 63, 6, 60ff.

Fusfeld, Herbert I., Richard N. Langlois, & Richard R. Nelson, The Changing Tide, Federal Support of Civilian Sector R & D. New York University, Center for Science and Technology Policy, New York, 1981.

Gaston, Jerry, Originality and Competition in Science. Chicago: The University of Chicago Press, 1973.

Gaston, Jerry, The Reward System in British and American Science. New York: John Wiley & Sons, 1978.

Gerstenfeld, Arthur, Effective Management of Research and Development. Reading, MA: Addison-Wesley, 1970.

Graham, Margaret B. W., "Industrial Research in the Age of Big Science," in Richard S. Rosenbloom (ed.), Research on Technological Innovation, Management and Policy. Vol. 2. Greenwich, CT: JAI Press, 1985.

Greenhaigh, Leonard, "SMR Forum: Managing Conflict," Sloan Management Review, Summer, 1986, 27, 4, 45-51.

Hackman, J. Richard & Greg R. Oldham, "The Job Diagnostic Survey: An Instrument for the Diagnosis of Jobs and the Evaluation of Job Redesign Projects," Technical Report #4, Department of Administrative Sciences, Yale University, May, 1974.

Hackman, J. Richard & Greg R. Oldham, Work Redesign. Reading, MA: Addison-Wesley, 1980.

Hackman, J. Richard & Greg R. Oldham, "Motivation Through the Design of Work: Test of a Theory," Organizational Behavior and Human Performance, 1976, 16, 250-279.

Haeberle, Warren O., The Scientific Community. New York: Basic Books, Inc., 1965.

Haire, Mason, Edwin E. Ghiselli, & Lyman W. Porter, "Cultural Patterns in the Role of the Manager," Industrial Relations, February, 1963, 2, 2.

Harris, D.B., "How National Cultures Shape Management Styles," Management Review, July, 1982, 58-61.

Henwood, F., Science, Technology, and Innovation: A Research Bibliograpy, 1984.

Hofstede, Geert, Culture's Consequences. Beverly Hills, CA: Sage Publications, 1980.

Hofstede, Geert, "Motivation, Leadership and Organization: Do American Theories Apply Abroad?", Organizational Dynamics, Summer, 1980, 42-63.

Hofstede, Geert, "Nationality and Espoused Values of Managers," Journal of Applied Psychology, April, 1976, 61, 2, 148-155.

Hoy, Frank & Don Hellriegel, "The Kilmann & Herden Model of Organizational Effectiveness Criteria for Small Business Managers," Academy of Management Journal, 1982, 25, 2, 308-322.

Irvine, John, Foresight in Science, Picking the Winners. London: Frances Pinter, 1984.

Janis, Irving L., Victims of Groupthink. Boston: Houghton Mifflin, 1972.

Janis, Irving L. & Leon Mann, Decision Making, A Psychological Analysis of Conflict, Choice, and Commitment. New York: The Free Press, 1977.

Johnson, Howard W., Chairman, Panel on Advanced Technology

Competition and the Industrialized Allies. International Competition in Advanced Technology, Decisions for America. Washington, D.C.: National Academy Press, 1983.

Jones, Lyle V., Gardner Lindzey & Porter E. Coggeshall, An Assessment of Research Doctorate Programs in the United States. Washington, DC: National Academy Press, 1982.

Kagano, Tadao, Ikujiro Nonaka, Kiyonori Sakakibara, & Akihiro Okumura, "Strategic Adaptation to Environment: Japanese and U.S. Firms Compared," Japanese Economic Studies, Winter, 1983-84, 12, 2, 33-80.

Kendrick, D.T. & D.O. Stringfield, "Personality Traits and the Eye of the Beholder: Crossing Some Traditional Philosophic Boundaries in the Search for Consistency in All of the People," Psychological Review, 1980, 87, 88-104.

Keys, J. Bernard & Thomas R. Miller, "The Japanese Management Theory Jungle," Academy of Management Review, 1984, 9, 2, 342-353.

Kilmann, Ralph R., Social Systems Design, Normative Theory and the MAPS Design Technology. New York: North-Holland, 1977.

Kilmann, Ralph R. & R. P. Herden, "Toward a Systematic Methodology for Evaluating the Impact of Interventions on Organizational Effectiveness," Academy of Management Reivew, 1976, 1, 3, 87-98.

Kilmann, Ralph R. & Ian Mitroff, Oranizational Problem Solving: A Social Science Approach. New York: North-Holland, 19 .

Kilmann, Ralph R. & Kenneth W. Thomas, "Interpersonal Conflict-Handling Behaviir as a Reflection of Jungian Personality Dimensions," Psychological Reports, December, 1975, 37, 3, Part I, 971-980.

Kilmann, Ralph R. & Kenneth W. Thomas, "Developing a Forced-Choice Measure of Conflict-Handling Behavior: The 'Mode' Instrument," Educational and Psychological Measurement, 1977, 37, 309-325.

Klett, C.J. & D.W. Yaukey, "A Cross-Cultural Comparison of Social Deirability," Journal of Social Psychology, 1959, 49, 19-26.

Kornhauser, W., Scientist in Industry: Conflict and Accommodation. Berkeley: University California, 1962.

Krauss, Ellis S., Thomas P. Rohlen (eds), & Patricia G. Steinhoff, Conflict in Japan. Honolulu: University of Hawaii Press, 1984.

Kraut, Allen I., "Some Recent Advances in Cross-National Management Research," Academy of Management Journal, September,

1975, 18, 3, 538-549.

Lambright, W. Henry & Albert H. Teich, "The Organizational Context of Scientific Research," in ul C. Nystrom & William H. Starbuck (eds.), Handbook of Organizational Design, Volume 2. Oxford, England: Oxford University Press, 1981.

Lawler, Edward E. III, Motivation in Work Organizations. Monterey, CA: Brooks/Cole Publishing Company, 1973.

Hubert M. Blalock, Jr., "A Power Analysis of Conflict Processes," in Edward J. Lawler & Barry Markowsky (eds.) Advances in Group Processes, Summer, 1987, 4 (forthcoming).

Lawless, David J., "Organisational Structure and Basic Units in Higher Education Institutions," International Journal of Institutional Management in Higher Education, July, 1983, 7, 2, 137-147.

Lewis, Darrell R. & W.W. Becker, Jr. (eds.) Academic Rewards in Higher Education. Cambridge, MA: Ballinger Publishing Co., 1979.

Likert, Rensis, The Human Organization. New York: McGraw Hill Book Company, 1967.

Lohr, Steve, "The Japanese Challenge, Can They Achieve Technological Supremacy?" The New York Times Magazine, July 8, 1984, 18ff.

March, James G. & Zur Shapira, "Managerial Perspectives on Risk and Risk Taking," Management Science, November, 1987, 33, 11, 1404-1418.

Marcson, Simon, The Scientist in American Industry, Some Organizational Determinants in Manpower Utilization. New York: Harper & Brothers, 1960.

Marsland, Stephen E., "Note on Japanese Management and Employment Systems," Harvard Business School Case Note 481-009, Cambridge, Mass., Harvard College, 1980.

Meyers, Isabel, The Meyers-Briggs Type Indicator. n.p.: Isabel Briggs-Meyers, 1962.

Mischel, W., Personality and Assessment. New York: John Wiley & Sons, 1968.

Mischel, W., "Alternatives in the Pursuit ofthe Predictability and consistency of Persons: Stable Data that Yield Unstable Interpretations," Journal of Personality, 1983, 51, 578-604.

Miller, Danny, "Chief Executive Personality (MBTI) and Corporate Strategy in Small Firms," Management Science, 32, 1389-1409.

Miller, Danny, "Top Executive Personality and Executive Strategy," in R. Lamb (ed.), Advances in Strategic Management, 4, Greenwich, CT: JAI Press, 1985, 223-232.

Miller, Donald B., Managing Professionals in Research and Development. San Francisco: Jossey-Bass Publishers, 1986.

Misumi, Jyuji, The Behavioral Science of Leadership. Ann Arbor: The University of Michigan Press, 1985.

Misumi, Jyugi & Mark F. Peterson, "The Performance-Maintenance (PM) Theory of Leadership: Review of a Japanese Research Program," Administrative Science Quarterly, June, 1985, 30, 2, 198-223.

Mombusho, An Outline of the University-Based Research System in Japan. Tokyo: Ministry of Education, Science and Culture, 1983.
National Academy Press, International Competition in Advanced Technology: Decisions for America. Washington, D.C.: National Academy Press, 1983.

MOW International Research Team, The Meaning of Working. New York: Academic Press, 1987.

National Science Foundation, The Process of Technological Innovation: Reviewing the Literature. Washington, D.C.: National Science Foundation, 1983.

Nightingale, Donald, "Conflict and Conflict Resolution," in George Strauss, Raymond C. Miles, Charles C. Snow, and Arnold S. Tannenbaum, Organizational Behavior: Research and Issues, Belmont, CA: Wadsworth, 1976.

Nonaka, Ikujiro & Johny K. Johansson, "Organizational Learning in Japanese Companies," in Robert Lamb & Paul Shrivastava (eds.), Advances in Strategic Management, Vol. 3, 277-296.

Northrup, Herbert R. & Margot E. Malin, Personnel Policies for engineers and Scientists, An Analysis of Major Corporate Practice. Philadelphia: University of Pennsylvania, The Wharton School, Industrial Research Unit, 1985.

Ohmae, Kenichi, Triad Power: The Coming Shape of Global Competition. New York: Free Press, 1985.

Ohsawa, Takeshi, "The Use of the MBTI in Japan," paper presented at the First National Conference on the Uses of the Myers-Briggs Type Indicator, Gainesville, University of Florida, 1975.

Ohsawa, Takeshi, "A Profile of Top Executives of Japanese Companies," paper presented at the Fourth Biennial Conference on the Myers-Briggs Type Indicator, Stanford, California, Stanford

University, 1981.

Oldham, Greg R., J. Richard Hackman & Lee P. Stepina, "Norms for the Job Diagnostic Survey," Technical Report No. 16, School of Organization and Management, Yale University, July, 1978.

Oldham, Greg R. & J. Richard Hackman, "Relationships Between Organizational Structure and Employee Reactions: Comparing Alternative Frameworks," Administrative Science Quarterly, March, 1981, 26, 1, 66-83.

Opinion Research Corporation, The Conflict Between the Scientific Mind and the Management Mind. Princeton: Opinion Research Corporation, 1959.

Ouchi, William C., Theory Z: How American Business Can Meet the Japanese Challenge, Reading, Mass., Addison-Wesley, 1981.

Ouchi, William C., "Markets, Bureaucracies and Clans," Administrative Science Quarterly, 1980, 25, 129-141.

Ouchi, William C., The M-Form Society. Reading, MA: Addison-Wesley, 1984.

Ouchi, William C., "The Transmission of Control Through the Organizational Hierarchy," Academy of Management Journal, 1978, 21, 2, 173-192.

Pascale, Richard T. & Anthony G. Athos, The Art of Japanese Management. New York: Simon and Schuster, 1981.

Pelz, Donald C., "Creative Tensions in the R & D Climate," Science, 1967, 157, 160-165.

Pelz, Donald C., "Environments for Creative Performance Within Universities," in Samuel Messick and Associates, Individuality in Learning. San Francisco: Jossey-Bass Publishers, 1978.

Pelz, Donald C. & Frank M. Andrews, Scientists in Organizations. Revised Edition. Ann Arbor: Institute for Social Research, University of Michigan, 1976.

Pelz, Donald C., Herbert Meyer, & Saul W. Gellerman, Organizing the Organization for Better R & D. New York: AMACOM, 1975.

Pierre, Andrew J. & Frank Press, A High Technology Gap, Eaurope, America and Japan. New York: Council on Foreign Relations, 1987.

Pondy, Louis R., "Organizational Conflict: Concepts and Models," Administrative Science Quarterly, September, 1967, 12, 2, 296-320.

Posner, Barry Z., "What's All the Fighting About? Conflicts in Project Management," IEEE Transactions on Engineering Management,

forthcoming.

Press, Jaques Cattell, Directory of American Research and Technology 1986, 20th Edition. New York: R.R. Bowker Company, 1986.

Pucik, Vladimir & Nina Hafvany, "Management Practices in Japan and Their Impact on Business Strategy," in Robert Lamb (ed.), Advances in Strategic Management, 1983, 1, 103-131.

Rahim, M. Afzalur, "Referent Role and Styles of Handling Interpersonal Conflict," The Journal of Social Psychology, February, 1986, 126, 1, 79-86.

Rahim, M. Afzalur, "A Measure of Styles of Handling Interpersonal Conflict," Academy of Management Journal, 1983, 26, 368-376.

Raudsepp, E., Managing Creative Scientists and Engineers. New York: Macmillan, 1963.

Roberts, Karlene H., "On Looking at an Elephant: An Evaluation of Cross-Cultural Research Related to Organizations," Psychological Bulletin, 1970, 74, 327-350.

Roberts, Karlene H. & William Glick, "The Job Characteristics Approach to Task Design: A Critical Review," Journal of Applied Psychology, April, 1981, 66, 2, 193-217.

Roberts, Karlene H. & Nakiye A. Boyacigiller, "Cross-National Organizational Research: The Grasp of Blind Men," Research in Organizational Behavior, 1984, 6, 423-475.

Ronen, Simcha, "Similarities Among Countries Based on Employee Work Values and Attitudes," Columbia World Journal of Business, Summer, 1977, 89-96.

Ross, M., "Salience of Reward and Intrinsic Motivation," Journal of Personality and Social Psychology, 1975, 32, 245-254.

Rossi, Peter H. & Richard A. Berk, "Varieties of Social Consensus," American Sociological Review, June, 1985, 50, 333-347.

Schein, Edgar H., "Coming to a New Awareness of Organizational Culture," Sloan Management Review, Winter, 1984, 25, 2, 3-16.

Schein, Edgar H., Organizational Culture and Leadership. San Francisco: Jossey-Bass Publishers, 1985.

Schmitt, Roland W., "Successful Corporate R & D," Harvard Business Review, May/June; 1985, 63, 3, 124-128.

Selznick, Philip, Leadership in Administration. New York: Harper & Brothers, 1957.

Sethi, S. Prakask, Nobuaki Namiki, & Carl L. Swanson, The False Promise of the Japanese Miracle. Boston: Pitman Publishing Company, 1984.

Shepard, H. A., "Supervisors and Subordinates in Research," Journal of Business, 1956, 29, 4, 265-

Shibata, Yusaku, "Toward a Policy Guidance System for Complex Innovation," Hajime Eto & Konomu Matsui, R & D Management Systems in Japanese Industry. Amsterdam, The Netherlands: Elsevier Science Publishers B.V. (North-Holland), 1984.

Shimada, Haruo, "The Perceptions and the Reality of Japanese Industrial Relations," in Lester C. Thurow (ed.), The Management Challenge. Cambridge, MA: The MIT Press, 1985.

Shimposha, Toyo, Japan Company Handbook. Tokyo:

Shrivastava, Paul & Ian Mitroff, "Frames of References Managers Use: A Study in the Applied Sociology of Knowledge," in Robert Lamb (ed.), Advances in Strategic Management, 1983, 1, 161-182.

Sinderman, C. J., Winning the Games Scientists Play. London: Plenum Press, 1982.

Smith, Bruce L. & Joseph J. Karlesky (eds.), The State of Academic Science. New York: Change Magazine Press, 1978.

Staw, Barry M., "Motivation Research vs the Art of Faculty Management," in J. L. Bess (ed.) College and University Organization: Insights from the Behavioral Sciences. New York: New York University Press, 1983.

Steers, Richard M. & Richard T. Mowday, "The Motivational Properties of Tasks," Academy of Management Review, October, 1977, 2, 645-658.

Suginoto, Y. & P. Mouer, Images of Japanese Society: A Study in the Social Construction of Reality. London: Routledge and Kegan Paul, 1984.

Sullivan, Jeremiah J., "A Critique of Theory Z," Academy of Management Review, 1983, 8, 55-67.

Sullivan, Jeremiah, Teruhiko Suzuki, & Yasumasa Kondo, "Managerial Theories of the Performance Control Process in Japanese and American Work Groups," Paper presented at the annual meeting of the Academy of Management, San Diego, 1985.

Teich, Albert H. & Jill H. Pace, Science and Technology in the United States of America. Harlow, Essex, England: Longman, 1986.

Thamhain, Hans J. & Gary R. Gemmill, "Influence Styles of Project Managers: Some Project Performance Correlates," Academy of Management Journal, June, 1974, 17, 2, 216-233.

Thamhain, Hans J. & David L. Wilemon, "Leadership, Conflict, and Program Management Effectiveness," Sloan Management Review, FALL, 1977, 19, 1, 69-89.

Thomas, Kenneth W., "Conflict and Conflict Management," in Marvin E. Dunnette (ed.), Handbook of Industrial and Organizational Psychology. Chicago: Rand, McNally, 1975.

Thomas, Kenneth W., "Organizational Conflict," in Stephen Kerr (ed.), Organizational Behavior. Columbus: Grid Publishing Company, 1979.

Thomas, Kenneth W., "Toward Multi-Dimensional Values in Teaching: The Example of Conflict Behaviors," Academy of Management Review; 1977, 2.

Thomason, George F., The Management of Research and Develooment, London: B.T. Batsford Ltd., 1970.

Toyo Keizai, "Company Ratings and Financial Data by Company,", Tokei Geppo (Statistical Monthly), 1985, 44, 8.

Triandis, Harry C., The Analysis of Subjective Culture. New York: John Wiley & Sons, 1972.

Turney, Jon (ed.), Sci-Tech Report. New York: Pantheon, 1984.

Van de Graaf, John H., "Can Departmental Structures Replace a Chair System? Comparative Perspectives," Yale Higher Education Research Group Working Paper, YHERG-46, New Haven, June, 1980.

Van de Ven, Andrew H., "Central Problems in the Management of Innovation," Management Science, 1986, 32, 5, 590-607.

Van de Ven, Andrew H. & Diane L. Ferry, Measuring and Assesing Organizations. New York: John Wiley & Sons, 1980.

Vroom Victor H., "Leaders and Leadership in Academe," in J.L. Bess (ed.), College and University Organization, Insights from the Behavioral Sciences. New York: New York University Press, 1984.

Wheeler, Donald F., "The Structure of Academic Governance in Japan," Yale Higher Education Program Working Paper YHEP-9, New Haven, 1976.

Walton, Richard E., Innovating to Compete. San Francisco: Jossey-Bass Publishers, Inc., 1987.

Wulff, Keith M. (ed.), Regulation of Scientific Inquiry. Boulder:

Westview Press, 1979.

Zuckerman, M. J., F. Porac, D. Lathin, R. Smith, & E.L. Deci, "On the Importance of Self-Determination for Intrinsically Motivated Behavior," Personality and Social Psychology Bulletin, 1978, 4, 443-446.